SCIENCE OF THE LOST PIGMENTS

Using Roman Pigments to Teach Heritage Science

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Introduction

- Heritage science is a research field that has emerged in the last 20 years.(1) The main aim of Heritage science is to study historic artifacts to determine their composition allowing for further conservation. (1)
- Heritage science has a local Scottish connection through the **distance stones**, discovered along the Antonine Wall. Through non-destructive analysis, the pigments that once decorated the surface of the stones could be determined (see below).
- This *outreach* and *teaching* unit was created with the aim of implementing **Process Orientated Guided Inquiry Learning** (2) for Advanced Higher chemistry pupils; This is a BSc student-led project.

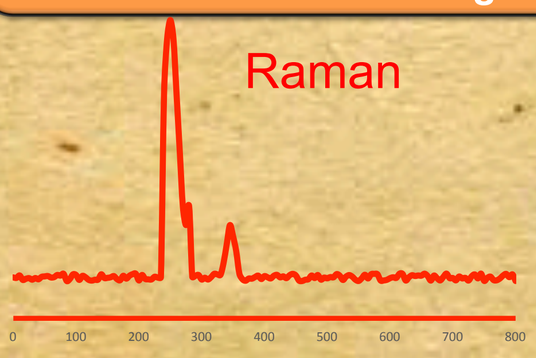
Digital reconstruction of pigments originally on stone

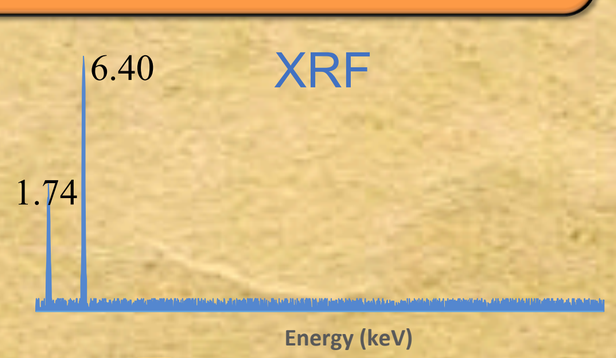
Weather & Time

Current appearance of stone, apparently bare

Digital reconstruction of the Bridgness distance stone (4)

Lost Pigments - Exercise





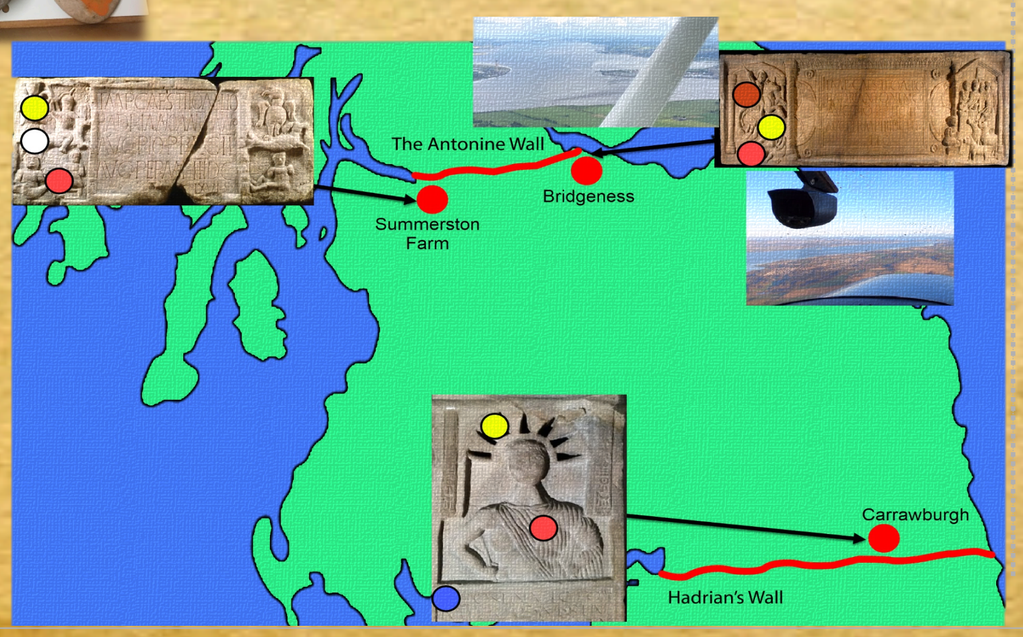
Pigment Identification

Colour + Stone Identification

Element Identification

Pigment Identification

Distance Stone & Location



Outcome

- ***Outreach impact:*** Most of the pupils were not aware of Heritage Science or how it could be a career path for chemists before the session.
- The session ignited an interest in studying chemistry to enter Heritage Science as 17/21 pupils said they were now more interested in studying chemistry.
- ***Teaching impact:*** Pupils reported positive feedback with 12/13 groups enjoying the exercise. Pupils felt that the exercise increased their confidence when tackling unknown problems.
- All 38 pupils stated they now better understand when to use certain chemical techniques for analysis.

Conclusions and Future Work

- Outreach was a success with more pupils understanding Heritage Science and the role a chemist plays in the field.
- Pupils gained increased problem-solving ability, increased confidence when solving unseen problems and a better understanding of analytical techniques via the **Process Orientated Guided Inquiry Learning** approach.
- Future work may include increasing the difficulty of the exercises by adding extra layers specifically in the XRF exercise.
- Promote Heritage Science by running the pack at more remote schools where Advanced Higher chemistry may not be offered and develop pack to allow teachers to run teaching unit independently.

References

1) T. R. S. o. Chemistry, *Analytical Methods*, 2015, 2900.
2) D. M. Hanson, *Instructor's guide to process-oriented guided-inquiry learning*, Citeseer, 2006.
3) Scottish Qualifications Authority, 2016.
4) Distance stone image provided by Dr Louisa Campbell

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